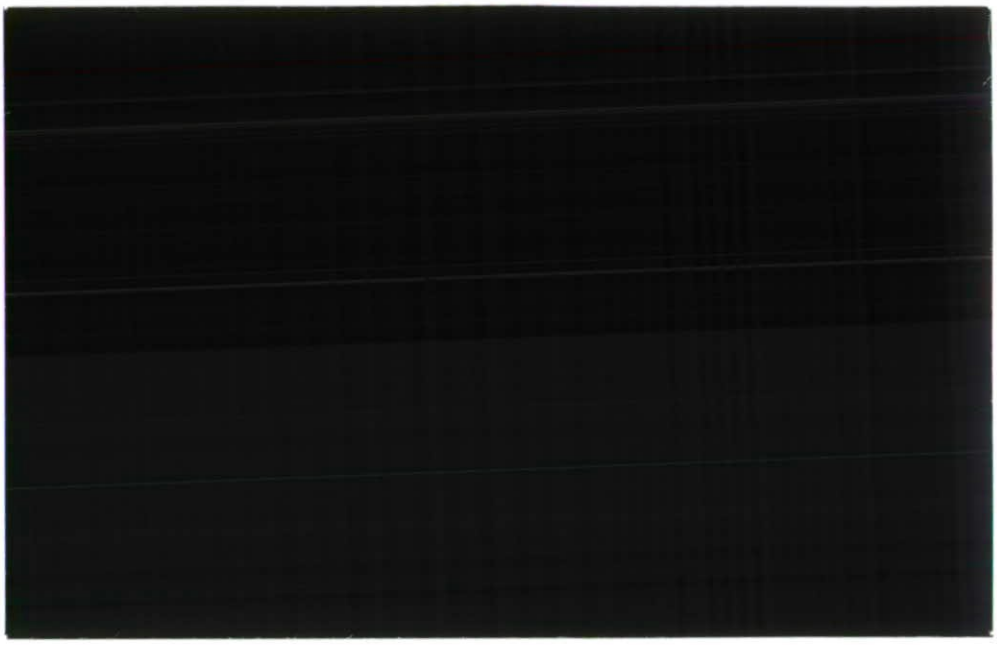
Institute of Hydrology

1995/035



Natural Environment Research Council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Darwin Initiative:

Biodiversity in the Himalaya

Progress Report - 1994/5

R C Johnson

Report on progress carried out by the Institute of Hydrology for the Department of the Environment, Darwin Initiative - April 1994 to February 1995.

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1. Objectives of the Project

The overall objective of this project is to investigate the consequences of river catchment management on the aquatic biodiversity of rivers and riparian zones in the Himalaya. Specific objectives are:

1. Carry out a wide range of environmental sampling to determine the key indicator biological species and hydrological, water quality, fluvial sediments parameters which are indicative of past environmental change;
2. Develop the use of aquatic biological indicators of environmental change;
3. Determine the effects of anthropogenic influences, primarily intensive agriculture and deforestation, on aquatic biodiversity, hydrology, water quality and fluvial sediments;
4. Undertake a study into the spatial patterns of biodiversity in the Himalaya to determine the long term sustainability of a range of species, habitats and ecosystems;
5. Undertake information exchange through lecturing at local universities, field visits with local scientists and workshop discussions;
6. Develop recommendations, in collaboration with local institutions, for applying the results to other regions and for the long term sustainability of biodiversity in the Himalaya.

The training element in the project will be undertaken by the visiting British scientists and the local universities. During the first visits to each country meetings will be arranged with university personnel, local scientists and relevant resources managers, to discuss past work, the Darwin project, sampling and analytical techniques and implications of the Darwin project results. During the surveys these people will be invited to the field sites to be shown and discuss techniques. Two workshops will be organised in India and Kathmandu, one in the second year to discuss past results and research techniques and the second near the end of the Darwin project to discuss the results and their implications for the countries involved.

2. Objectives for 1994/5

The proposed objectives including target dates for completion during 1994/5 were:

1. Establish links with and visits to collaborating institutions in Nepal, India and Bhutan - October 1994;

2. Regional survey in Nepal - December 1994;

3. Analysis of Nepal survey June 1995.

3. Achievements during 1994/5

1. *R C Johnson and A Jenkins of the Institute of Hydrology visited Nepal in September 1994 to establish links with collaborating organisations in Nepal and visit the area for the first survey.*

The purpose of the visit was to discuss as widely as possible the Darwin Initiative, the Himalayan Biodiversity project 1994/5 surveys and to develop a formal link with one or more of the organisations in Kathmandu. 10 meetings were arranged during the week of September 19th 1994 then R Johnson spent the following week in western Nepal preparing for the surveys to be undertaken in November.

The main points from the meetings were:

1. **ICIMOD** - Mr P B Shah

ICIMOD remain very interested in the project but can not collaborate because of other commitments this year. They are keen to be invited to the project workshops and are willing to offer informal help to establish contacts and discuss access in India and Bhutan. Mr Shah suggested potential collaborators from India and Bhutan be invited to the first workshop in 1995 with the project paying their travel expenses.

2. Departments of Biology and Geology, Tribhuvan University, Kathmandu - Prof M Sharma and Dr P Adhikari

Following a discussion of the project and past results from Nepal, the Departments expressed a keen interest to become involved in the project. They were particularly pleased to identify a specific role for their biologists and geologists on each survey and they could also help with providing topography, geology, land use maps etc. of the survey regions.

Once the details of the proposal had been further discussed a meeting was held with **The Vice-Chancellor of the University, Dr K Mathema**. He was delighted with the proposal and agreed that the University should collaborate with the project. Arrangements were later made for the team to registered formally as visiting researchers to the University.

3. IUCN - Dr T Shrestha

IUCN are extremely interested in biodiversity so were keen to be kept informed on progress in all three years. An offer was made to contribute and article on the project for their IUCN - Nepal newsletter - it was suggested that this be written once the results from the first survey were available.

4. Department of Hydrology and Meteorology - Dr A Pokhrel

The Department has no direct interest in biodiversity but was willing to collaborate by offering climate and river flow data for the regions to be visited. They were particularly

interested in the sediment and chemistry monitoring which would be undertaken.

5. Water and Energy Commission - Dr G Bhatta and Dr Adhikari

They had no direct interest but in all of their work the impact of water resources developments, including biodiversity and sediments, was becoming a higher priority so they would be interested in the results as a baseline and to establish methodologies to identify changes. An invitation was offered to present initial results from the project at their conference in April 1995 - this was later postponed to April 1996.

6. Forestry and Soil Conservation - Dr Sthapit

Information on the project exchanged and invitation to the workshop offered.

7. Central Soil Division - Mr Maskey

Information on the project exchanged and invitation to the workshop offered.

8. British Embassy - Mr K Brind

Information on the project exchanged and invitation to the workshop offered.

9. Ultimate Descents - Mr D Allardice

Ultimate Descents were approached because logistical support for the survey teams is essential, the organisation knows some of the areas and is currently establishing their own environmental/aid programme. Detailed plans for surveys were discussed.

The main points from the field trip were:

1. Travel in the region is extremely unreliable, it was not possible to get from Kathmandu to Simikot in one day and the direct Jumla flight is liable to cancelation at the last minute. Its is however possible to do the return journey in one day. Baggage weight is restricted to 15kg/person, often including hand luggage;

2. Food and drink in all places is very limited so an independent source is essential;

3. Police checks are frequent because of the proximity of the Chinese border so each team has to carry the necessary documentation at all times;

4. Simikot is in the upper part of the Karnali where the valley is very deep and slopes are steep. Some agriculture is carried out on rain-fed terraces. The main crops are wheat and barley and nobody knew of any fertilised applications. Forests are extensive away from the flatter cultivated areas. The main river and some tributaries are glacier fed but other sub-catchments are snow and ice free. The path beyond Simikot to the border is quite a popular trekking route but little information was available on other paths;

6. Jumla is on the Tila River in a region reminiscent of an Alpine mountain scene. The lower parts of the main valley are cultivated with irrigated terracing but on the slopes forests and grass make it a pleasant area. Apples are a major cash crop which tend to take priority over people on the flights out to Nepalgung. There are supposed to be no glacier fed rivers around Jumla although the eastern mountains were still partially snow covered. The trek to Rara is popular and tea houses exist along the way, little information was available on other routes.

2. Regional survey in western Nepal

A regional survey was undertaken in Nepal during November and December 1994 in post monsoon low flow conditions. Three teams of scientists from Britain and Nepal spent 3 weeks in the field travelling on pre-selected routes in the upper Karnali and Arun river basins. Sampling at 250 streams and rivers was carried out for stream water chemistry, geology and catchment characteristics and at 76 rivers for river habitat surveys, birds, bryophytes, diatoms, micro-invertebrates, macro-invertebrates, nematodes, coarse sediments and channel dimensions. The sampling covered a range of environments from rivers in areas of intensive agriculture at 2000m a.m.s.l. to pristine high altitude environments at 4000m a.m.s.l.. The team members from Tribhuvan University contributed to the survey bringing their own skills and were also shown the techniques used in the other sampling.

Survey 1 (6 people) travelled by air from Kathmandu to Jumla via Nepalgung then by foot to Simikot via the Rara Lake National Park returning by air to Kathmandu via Nepalgung. Logistical support was provided by Wilderness Experience as the area was so remote. Conditions ranged from valley bottom terraced agriculture to high altitude scrub and forested land providing a good mixture of rivers to sample.

Survey 2 (4 people) travelled by air from Kathmandu to Jumla via Nepalgung then by foot to Dunai and back to Jumla returning by air to Kathmandu via Nepalgung. Logistical support was again by Wilderness Experience. Conditions were similar to those for Survey 1 although high altitude conditions were worse necessitating a modification to the planned route.

Survey 3 (4 people) travelled by air from Kathmandu to Chainpur then by foot around the Arun valley returning to Kathmandu by air. The team was self supporting as the area was not so remote and food and accommodation were available. Conditions were generally wetter than the other two surveys with more intensive agriculture.

The sampling consisted of:

i) **River habitat survey** - assessments of river structures over a 200m reach were made using a methodology developed by the UK National Rivers Authority, modified for work in the Himalaya. The aim of this part of the work was to record structural features which might reflect natural and anthropogenic influences on Himalayan rivers and which might affect biological communities;

ii) **River bird surveys** - communities of river birds were surveyed over a 200m reach at each site with identifications to species;

iii) **Bryophyte surveys** - representatives of all aquatic mosses present at each site were collected and are being identified as far as possible to species;

iv) **Diatoms surveys** - epilithic diatoms at each site were collected and are being identified to species;

v) **Micro-invertebrate surveys** - micro-crustaceans were collected at each site in two of the regions using a fine mesh kick sampling (100μm). Identification will be made to family;

vi) **Macro-invertebrate surveys** - macro-invertebrates were collected from two habitats (river margins and riffles) at each site using coarse net kick sampling (400μm). Identifications are being made to family;

vii) **Nematodes** - soil nematodes were collected but difficulties were experienced with storage and transport of the samples;

ix) **Chemistry** - major anions and cations;

x) **Coarse sediments** - size analysis of random samples from river channel;

xi) **Channel dimensions** - width and gradient;

xii) **Geology** - sample catchments and mapping along routes;

xiii) **Catchment characteristics** - land use and area.

3. Analysis of survey data

Analysis of the Nepal survey data is currently being carried out to determine the main physical and chemical controls on biodiversity and whether regional, climatic or cultural related trends exist. Information on each catchment is being obtained from available maps (supplied by ICIMOD), and field observations but the remote sensing techniques have proved too expensive considering the little extra information which would be gained.

4. Planning for 1995/6

The objectives, including target dates for completion, for 1995/6 are:

1. Analysis of Nepal survey data - June 1995;

This is progressing satisfactorily. A visit is planned to Tribhuvan University in April 1995 to discuss the analysis and to present the initial results.

2. First workshop - November 1995;

Initial planning will be carried out during the visit in April 1995;

3. Regional survey in India - December 1995;

This is now being planned for November/December 1995 to the mountain areas of Uttar Pradesh. Contacts are being made with organisations in Roorkee, Derha Dun and Almora and it is proposed to visit these people in April 1995.

4. Analysis of Indian survey data - June 1996;

5. Summary

The first year of the project has been very successful and the main objectives of establishing collaborative links with organisations in Nepal and carrying out the survey in western Nepal have been achieved. Plans for the next phase of the project are progressing with the first visit to India planned for April 1995.

R C Johnson